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ON THE NESTING HABITS OF *CALLANTHIDIUM ILLUSTRE* (CRESSON) (HYMENOP.).

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Quite a little is known concerning the nesting habits of Anthidiine bees of the genus *Anthidium* and *Dianthidium,* but less of those of related genera, such as *Callanthidium, Heteranthidium, Paranthidium,* and *Anthidiellum.*

Bees of the genus *Anthidium* commonly use the down or hairs of plants in the construction of their cell and have been termed "cotton-workers" because of this habit. The nests are placed usually, if not always, in natural cavities or in cavities or tunnels already formed by other insects. Some may even, as in the case of *A. porterae* Ckll. ('27), drive another nesting insect away and appropriate the tunnel. The cavity in the tunnel above the nest may be filled to the surface with down, or partly with down, followed by pebbles or available debris, depending upon the species. The *Dianthidia,* on the other hand, use no down, but instead, resin from plants to glue pebbles together to form the cell for the pollen. Other material, such as pieces of dead stems, leaves, hard soil, etc., may sometimes be used in addition to the more commonly used pebbles. Some *Anthidiella* use resin and thus resemble the *Dianthidia* in this respect.

Johnson ('04) reports having found the nests of *Callanthidium illustre* (Cress.) (under the name of *Anthidium illustre*) in the deserted burrows of a bee, *Anthophora occidentalis,* at Denver, Colorado. The bee had gathered down from two species of plants to form cells for the reception of the pollen. Johnson states: "The nests vary somewhat in form, but are usually cylindrical, about 20 mm. long and 8 mm. in diameter. They are placed end to end and commonly number from two to four in a burrow."

The nests of *C. illustre* resemble most, in general type, those constructed by bees of the genus *Anthidium* but the use of resin suggests the habits of *Dianthidium.* Although *C. illustre* was first placed in the genus *Anthidium,* it was later referred to the *Dianthidium,* and lastly to *Callanthidium* of which it is the type species. In describing the new genus Professor Cockerell ('25) stated: "There is some affinity with *Dianthidium* to which genus I wrongly referred the type species in 1914." It is interesting that the nesting habits suggest a relationship to those of both genera.

The following account is based on a study of nests found in old, dead yucca (*Yucca whipplei*) flower stalks near Pasadena, California. *C. illustre* appears to have availed herself in these instances, of tunnels already made by coleopterous larvae. This is evidenced by the varying position of the cells and the size of the next conforming to the bounds of the beetle tunnel. Furthermore, the entrance to the nest affords evidence of having previously served as an exit for the mature beetle upon emerging.

A nest of *C. illustre*[1] taken December 26, 1927, in the Wash of Tujunga Canyon near Sunland, some fifteen miles northwest of Pasadena, contained ten

1.—Kindly determined by Professor P. H. Timberlake.

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cells of this bee. The entrance to the nest was found at a height of four and one-half feet above the ground, in a stalk which had apparently been standing for two or three years. This stalk, as others in which the bee has been found nesting, was large, measuring 50 mm. in diameter at the entrance to the nest. A plug or cap, 8 mm. across, 18 mm. long, and 5 mm. thick partially concealed the entrance. This plug was constructed of small pieces of old stems, seeds, pebbles, and débris, forming a somewhat compact mass, the components of which were held together by a small amount of resinous substance. The resin was not especially abundant but was sufficient to hold the materials firmly and to form a more solid, denser layer to the outside. The outer layer was concave in outline and dark in color. The space below the plug for a distance of 15 mm. was loosely filled with pebbles, among which were a very few pieces of old stems.

The nest proper was immediately below the pebbles, first seen as a mass of down. The down had not been collected from a single species of plant but from at least three, as shown by the contrasting types which varied both in color and in texture. The mass was 112 mm. long, from 16 to 22 mm. across, and some 10 to 16 mm. thick. These variations were doubtless due to varying dimensions of the cavity appropriated. The down, between the pebbles and the first or upper cells, was over mm. in length.

The cells consisted of two rows running the length of the mass and separated one from another by down. On one side a large beetle larva (*Trigidion armatum* Lec.[2]) was found in a tunnel and had apparently encroached earlier in the season upon the nest of *C. illustre* for two cells had been badly damaged and the bee egg or larva destroyed before the pollen had been eaten. The remaining eight cells contained cocoons, vertical in position with their mammillary points extending upwards or towards the exit.

The beetle larva was placed in a jar with an abundance of yucca stem where it apparently fed until pupation, during the last of April. The pupa was very active when stimulated mechanically and was able to move rapidly up and down the tunnel of the stalk. The adult emerged April 22 and was still alive and active, although not having fed in the interval, on May 7. H. C. Fall ('01) says of the adult of this beetle: "*T. armatum* has been taken at Newhill (Van Dyke) while sucking sap from the flowering *Yucca whipplei*."

The cocoons of the bee were removed from the stem, placed in vials with cotton stoppers and kept in the laboratory at slightly above room temperature until the bees emerged. They varied a little in size but were similar in general form and structure. One cocoon, which appeared average, served as a basis for the following description. The cocoon is closely surrounded by down to which it clings with considerable tenacity. This close adherence is due to the fact that the excrement of the bee is plastered about the inner cell wall of down before the cocoon is spun. The down sticks to the excrement and the cocoon is formed in close contact with it, making the three nearly inseparable. The anterior point is freest from down with the mammillary point freely exposed in the center. The base is somewhat more surrounded by pellets of excrement than is the rest of the cocoon.

2.—Kindly determined by Dr. L. J. Muchmore of the Los Angeles Museum.

The cocoon, somewhat oblong in form, measures 14 mm. in length, 8 mm. across near the base, and 5 mm. near the anterior end. The mammillary point is a little more than one millimeter long, about the same diameter at its base, but narrowing to a blunt point at the end. Seen from above, the projection has a distinct opening surrounded by loose, yellowish fibers. This forms an outer cap which can easily be removed by forceps exposing a smaller, denser, darker projection beneath, which still retains an opening. Further removing this material, one finds that beneath the opening there is a layer of silk continuous with the rest of the cocoon. The cocoon is not so thick but that, when held in a strong light, the larva can be faintly seen within, through its cherry-red walls. The larva is light in color and does not entirely fill the space within the cocoon.

One larva pupated on February 1st, cast its pupal skin February 17th, and was a mature male two days later. From the eight cocoons taken December 26, 1927, five adults had emerged between February 18, 1928 and February 25th; two had died in the larval state, due probably to mechanical injury; and one was still a larva many weeks later. Some evidence has been found that a larva may sometimes, in the field as well as in the laboratory, wait months before completing its development, even after the other individuals of the same nest have long since emerged.

A number of nests have been found destroyed by a woodpecker or bird of similar habits. The bird is able to locate the exact position of the cocoon and pecks into the stem until the cell is reached. A large hole is then made in the side of the cocoon and the food content removed. In one instance the nest circled about the stem and the bird had hit the cell accurately each time, although the cocoon was some two inches beneath, separated by the pithy material within and the hard wall on the outside. The extent of injury in this area was great, but I do not know how widespread is the general damage. *C. illustre* apparently is somewhat versatile in the selection of nest sites and may thus often avoid the attacks from birds by nesting elsewhere.

Professor T. D. A. Cockerell ('25) reports eight localities in California where *C. illustre* has been taken. The date of capture ranges from May 24 to July 13. Professor P. H. Timberlake has kindly furnished me with the following additional information in regard to the species. He says: "My collecting dates suggest only one brood, as in the lowlands I have taken it from April 11 to June 11, and in the mountains (about 6-7000 feet) from July 12-16. I have taken it at Riverside, Puente Hills (near Whittier), Santa Paula, Coffee Camp and Three Rivers in Tulare county, and at Big Pines in San Gabriel mountains. I have found it visiting *Phacelia ramosissima, Phacelia heterophylla, Lotus scoparius* and *Trifolium variegatum.*"

Dr. Herbert F. Schwarz, of the American Museum of Natural History has kindly furnished me with some additional references. In the American Museum collection there are four specimens of *C. illustre*: Three were collected at Big Pines Camp, in California on July 15-17th, 1927 and donated by Professor P. H. Timberlake; a fourth from Jemez Springs, New Mexico, collected by John Woodgate on July 5th, 1913. This species, or a variety of it, has been reported from Nevada by Morrison, Nebraska by Swenk (under varietal name *serranum*),

and Flagstaff, Arizona by Cockerell. There may be other records with which I am not familiar.

On the afternoon of April 15, 1928, I found *C. illustre* very common at East Pasadena, visiting patches of flowers of *Lotus scoparius*. The females were collecting pollen and nectar; the males feeding from the flowers and for the most part attempting to mate with the females. I captured a male and female and could easily have obtained many more had I not desired rather to observe them. At one time seven and at another ten of these insects were found within an area some twelve feet square.

The females were busily visiting one flower after another and brushing the pollen from their legs to the ventral scopa. In many attempts to observe the exact process none were successful. It appeared that the mid and hind legs were used at nearly each individual flower. One female was seen to visit fifty-four flowers in a short time and the number visited on a given collecting trip must be large indeed. An *Anthidium* male came upon this female as though in an attempt to mate with her, thus causing her to fly away. The pollen of *L. scoparius* must have become, in a number of instances, part of the food for the young of this bee.

The males were quite active and resembled in habits those of *Anthidia* (*A. porterae*, etc.) males. They hovered, humming-bird fashion in the air before a flower or bee, slowly turning about in position or quickly darting away. Much of their energy and activity was spent in following the females, darting upon them and attempting to copulate. A male would often fly after a female as she went from flower to flower, hovering now below her, now above, or again at her side, awaiting an opportunity to spring upon her. Usually she avoided his rushes, although his nearly constant attention must have interfered somewhat with her nest provision. One pair, in mating, fell to the ground but the branches and leaves were so thick I could not well observe the bees and my attempts frightened them apart. One male followed a female on rapid wing, far into the fields out of sight. Again, two males were hovering near one female. One darted upon her followed by the second which struck the first, ending the encounter. It was noted that the males sometimes moved the hind legs up and down in a peculiar manner when hovering before a flower or before a female.

Often a male rested leisurely for a time on a leaf, grass head, or rock. The antennae at this time were extended forward and a trifle to the side; the wings backward in a similar manner. The bee would then remain nearly motionless, except for a rapid contraction of the abdomen, until he would suddenly dart away. It was found that these males often return to the same spot to rest—a habit often observed in the males of other species of bees. The abundance of these bees on this date suggests that they had been abroad for a few days, as many females were busily collecting pollen. The nests were not located and no yucca stalks could be found near. Either they were nesting in other cavities or else they were flying a very long distance. The following day I found more bees at the same place.

On April 22, 1928 at Pasadena, I had the good fortune to observe *C. illustre* select a nest site and start provisioning the nest. During the morning several females had been seen flying about exit holes of beetle burrows in dead stumps of Live Oak, or going in and out of the tunnels. The stumps contained portions of the roots, which had been unearthed and left in the open and in which many insects now found suitable nesting places.

At 11.53 a.m. a female *C. illustre,* after having entered many tunnels, remained within one a longer time than usual. She soon backed out with débris, consisting of wood and refuse left by the beetle. The material was forced back and out beneath her by her legs and fell over the edge of the orifice to the ground. She worked actively, not leaving the tunnel except for an occasional brief flight to the fields. During seven minutes of continuous work the bee brought out nineteen loads of material and her ventral scopa became covered with dust and small pieces of wood. Only twelve loads were carried out during the next twenty minutes but six trips were made abroad. Each time, upon returning, she flew about the stump before entering her tunnel, but did not once enter the wrong one. Toward the end of this period the bee worked less energetically and her trips to the fields were longer. Her manner and work suggested that she was about to gather down. The last trip afield (before down was actually carried to the nest) was begun by the bee flying to the leaf of a Poison Oak (*Rhus diversiloba*) and attempting to obtain down from the under side. She then flew to another leaf of the bush and repeated the attempt, after which she flew away and was lost from view. It would appear from this and other observations that the bee, ready to prepare her cell, goes in search of down from plant to plant, continuing until she finds a suitable one. In eleven minutes (or forty-seven minutes after the tunnel was appropriated) she returned with the first ball of down, spending about a minute in the nest. The first ball was quite small and it was noticed that the second and third each was larger than the preceding, continuing an increase until a nearly uniform size was soon maintained. During the afternoon the bee varied somewhat in the period of time taken in securing a load of down. However, she spent on an average about five minutes to a trip, remaining a little more than a minute within the tunnel on her return. On two occasions a part of the down caught on the edge of the tunnel when entering and later, on coming out *C. illustre* each time picked this off with her mandibles and carried it into the nest. The cavity of the tunnel was large enough for the bee to turn around inside for she always came out head first as she had entered.

At 4.30 p.m. she returned with her first load of pollen, having left on this trip at 4.13 p.m. She did not leave the nest until five minutes later. The stump being in the shade and the weather now cooler, *C. illustre* worked but little more that day. The next afternoon she was still carrying pollen, but at 2.31 p.m. she began to bring down. This work continued during the rest of afternoon, although the shade appeared again to cut short her activities early.

Two days later she was found filling in the entrance tunnel with down. She was now near the surface where her abdomen could be seen as she moved about working each load in place. She often made two complete revolutions

within while slowly arranging it. Many attempts were made at this time to follow her to the plant from which she obtained the down but each failed.

Cotton was placed at the entrance of the tunnel to see if she would use it in place of the down. She tried this material but the fibers were too long and after using a little of it she returned to the field for her accustomed "wool."

While she was away the tunnel was plugged a few millimeters with cotton and on her return she worked her ball carefully into place as before, not being disconcerted by the substitute. After two more loads she quit the work for the day, for after a few return trips of inspection she flew away and was seen no more. The down in the tunnel was now concave in outline and ready for the pebbles.

Academic duties prevented me from returning to the field the next day, and the nest was not visited until the following afternoon. On returning, it was found complete with a cap of pebbles to the outside, tightly held together with a clear, resinous subsance. The nest was taken May 30th, eight days after the bee had begun nesting and three days after the tunnel had doubtless been closed. The following is an account of this nest:

The outer plug was thin and entirely composed of pebbles glued together with resin. Loose pebbles filled the space between it and the down. The nest was in a winding tunnel which brought the main part of the nest close to the hard, outer surface of the stump. The cells were two in number separated by a thin partition of down. The upper cell (the egg of which was probably laid three days earlier) contained a larva 2 mm. long. It was light in color, somewhat curved and rested half embedded on the surface of the pollen mass. The lower cell was so injured that I was unable to find either egg or larva. The provisions of each consisted of pollen and honey of the consistency of thick molasses.

While taking the above nest a female was seen to enter a similar beetle tunnel located in a part of an exposed root near the ground. Almost immediately another *C. illustre* came and attempted to enter. She could not go far but was forced to back out, waiting at the entrance until the former came into view, whereupon she bit at her exposed abdomen. They soon flew in the air, hovered facing each other a brief second, then clashed and flew out of sight. One soon returned, began carrying out debris, and was backing out with some down when the other arrived. The latter began, as in the earlier encounter, to bite at the abdomen of the working female until they both flew into the air, clashed, and dropped to the ground. Quickly arriving on the spot it was found that each had hold of the mid leg of the other with her jaws. The bees held on tenaciously and tried to strike each other with the tips of their abdomens. This lasted a few seconds after which each flew away. Later observations found them entering alternately for a time. However, during the last half hour of observation only one was working, the other apparently having given up the tunnel. Further evidence of this was found in the fact that on the following day the nest was successfully finished.

The cap or plug of the nest was 14 mm. from the outer surface and was purplish and reddish in appearance, concave in outline. Later dissection showed that this material was firm and tightly held together the pebbles. The source and

nature of the substance was puzzling. Many plants were examined within a wide radius but none was found which combined the color and stickiness of the material. The color suggested that some of it had been secured from Cacti (dead, cochineal insects) but there is little accurate data to substantiate this.

The plug was a trifle more than one pebble layer thick. A space of 5 mm. below it was filled with pebbles, and down mixed with pebbles near the continuous down of the nest proper. The latter was 38 mm. long, the down of which was of two types. The single cell, 17 mm. long, had pollen in 12 mm. of its length. Some down was below this cell as well as above it. The beetle tunnel measured 9 mm. by 5 mm., the pollen mass nearly conforming with these dimensions except in length. The bee was doubtless using the tunnel of a flat-headed beetle borer. The larva, as in other instances, was partly embedded in the food.

A study of the above nests and others has shown considerable variation in the size, position, length, number of cells of a nest, etc., depending to a large extent on the type of tunnel appropriated. A second cap of the reddish and purplish material was found; others have been of clear or dark resinous substance, the nature and kind probably dependent upon the available plants of the nesting territory.

Previous to May 5th I had been unable to find *C. illustre* gathering down. On that date a female, nesting in a yucca stem (which had been placed near the stump for the bees), was followed 103 feet to the source. This plant, *Lepidospartum squamatum,* (used also by *Anthidium mormonum fragariellum* Ckll.*) was repeatedly visited by the same bee for down, but in a few instances she stopped at a similar plant 17 feet nearer the nest. In general the average time taken to get a load was 47 seconds. She would alight near the tips of the plants and rapidly pull loose the down, and collect it in a ball held in the space formed by the curving down of the abdomen and the slightly outspread mid and hind legs. These legs likewise held the bee to the plant but the fore legs were free, for the most part, and aided in forming the ball by pushing back the down as it was secured by the mandibles. The ball was free until the bee was ready to move to another leaf or stem (she sometimes changed positions two or three times at a given plant before a load was secured), or to return to the nest whereupon the mandibles alone held the down. The bee worked downwards, neatly removing the hairs which left the plant bright green instead of grayish in color. By examining the plants growing in a nesting territory, one can readily locate nesting bees and later sometimes follow them to their nests.

C. illustre, on returning to her nest with a load of down, flew low above the surface in a direct path at a height of from two to four feet. She remained within the tunnel, after one load, for 22 seconds. Later she was observed to change from down to pebbles in filling the tunnel. At first she alighted on the ground near, walked about or hesitated as though about to pick up a pebble but after a time went for down. This was repeated a few times, then a couple of pebbles were carried, after which a load of down was secured. She continued for nearly a half hour to carry from one to four (once seven) pebbles or sticks followed by a trip to the fields. She often returned with down but on

*—Determined by P. H. Timberlake.

several occasions she carried nothing at all or possibly resin. Later she carried only pebbles, secured near the nest at a distance of from two to six feet. There seems to be, in many instances, a somewhat gradual transition from one series of activities to another.

At this nest a large parasitic bee, *Dioxys aurifuscus* (Titus),* was found. Dr. Cockerell ('09) has reported this species from the nest of *Anthidium* sp. He says: "This very rare bee was found by Mr. E. Bethel in a nest of cottony tomentum, evidently made by a species of *Anthidium* on which it must be parasitic." The nests were found at Golden, Colorado. At Pasadena, this parasitic bee entered while *C. illustre* was within the nest and was caught while hastily leaving a few seconds later. A few minutes later another individual came and entered while the worker was away. Others were later found at this and other nests in the yucca stalk and in the stumps. The favorable size of the parasitic bee, the fact that different individuals of the same species entered the nesting tunnels on several different days strongly suggests that it may be a parasite of *C. illustre*. However, parasites occasionally, if not often, enter nests of insects other than the host, thus necessitating rearing the two or otherwise showing the relationship.

A plant of wild buckwheat (*Eriogonum fasciculatum*) grew near the nest and at one time *C. illustre* alighted on it and appeared to feed from the flowers, but hastily left as though it were distasteful to her. At another nest the bee was observed, in filling the tunnel, to secure old down from a used tunnel from which bees had earlier emerged and thus she saved time by not having to go to the fields for it. However, the bees are not usually so provident, often going distances for material which could readily be secured near at hand.

During two hours spent in the field on May 12th during the heat of the day, none of these bees were seen about the stumps, yucca stalks, or on the flowers. The weather had been cool and wet for a few days previous and the bees had probably not come out of their nesting places, for they were found quite common in tunnels, on that day and for a few days following.

Many nests have been marked and will later be studied in order that parasites may be reared and additional facts obtained in regard to the biology of *C. illustre*. Her large size, versatility in appropriations of nest sites, variations in details of nests constructed, and the comparative ease with which the cells may be obtained here, commend her for study both during the summer and winter months and for observation in the fields as well as in the laboratory.

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*—Determined by Professor P. H. Timberlake.

NOTES ON A FEW SPECIES OF MYZINI (APHIDIDAE) FROM UTAH WITH DESCRIPTIONS OF TWO NEW SPECIES.[1]

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Myzus cerasi (Fabricius).

This black cherry aphid is common in nearly all localities in Utah where cherries are grown and causes many of the apical leaves to curl. Small numbers of this species remain on the cherry leaves throughout the summer at Brigham City and Farmington, but are present in much greater numbers during the spring.

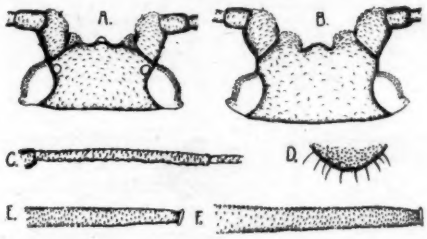

Fig. 1. *Myzus cerasi* (Fabricius). *A*. Head of alate viviparous; *B*. Head of apterous viviparous; *C*. Antennal III of alate; *D*. Anal plate of apterous; *E*. Cornicle of alate; *F*. Cornicle of apterous.

Myzus persicae (Sulzer).

The green peach aphid is frequently encountered throughout the agricultural sections of Utah, attacking a large variety of economic crops; it also frequently extends to weeds.

During the summer of 1924, this species was collected in Utah upon 37 different species of plants and has since been found on many others. Besides causing damage to peach leaves, this species frequently becomes a pest of truck

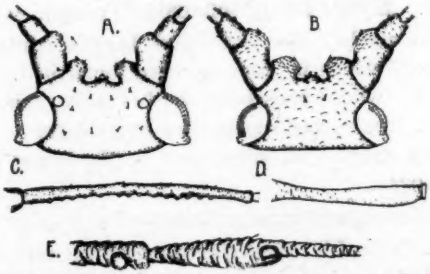

Fig. 2. *Myzus persicae* (Sulzer). *A*. Head of alate viviparous; *B*. Head of apterous viviparous; *C*. Antennal III of alate; *D*. Cornicle of alate; *E*. Part of antennal V and VI of alate.

crops, greenhouse plants, and flower gardens. Undoubtedly, this species has some importance in connection with the spread of certain plant diseases. It is one of the most common aphids taken on potatoes, tomatoes, beets, squash, mel-

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2.—The writer wishes to express his appreciation to Professor O. W. Oestlund, Dr. P. W. Mason, and Dr. E. M. Patch, for their opinions concerning a number of the species discussed in this paper.

ons, turnips, corn, strawberries, and is also common on wheat, oats, and a great variety of other plants.

Myzus aquilegiae Essig.

The species was found on July 8, 1925, commonly attacking Colorado columbine, *Aquilegia caerulea,* on Mt. Bryan and at Cedar Breaks, Utah, through the aspen belt and up to an elevation of nearly 11,000 feet.

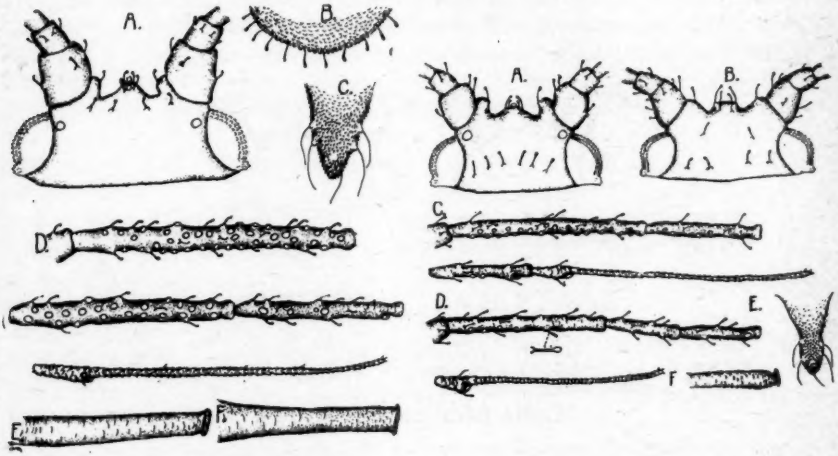

Fig. 3. *Myzus aquilegiae* Essig. *A.* Head of alate viviparous; *B.* Anal plate of alate; *C.* Cauda of apterous viviparous; *D.* Antenna of alate; *E.* Cornicle of alate; *F.* Cornicle of apterous.

Fig. 4. *Myzus houghtonensis* (Troop). *A.* Head of alate viviparous; *B.* Head of apterous viviparous; *C.* Antenna of alate; *D.* Antenna of apterous; *E.* Cauda of alate; *F.* Cornicle of alate.

Myzus houghtonensis (Troop).

This aphid, commonly known as the gooseberry witch-broom aphid, and the typical "witch's broom" which it produces were found in Logan, Utah, on June 21, 1926. The owner whose gooseberry bushes were quite severely damaged stated that this same trouble had existed for several years. The galls and the aphids they contained agreed with those taken by the writer in Columbus, Ohio, during the fall of 1924.

Neomyzus circumflexus (Buckton).

This pretty yellow and black species of aphid was collected on pansy, *Viola tricolor,* in Logan, Utah, on August 24, 1923. Collections were made in a greenhouse during the following winter on the calla lily, *Zantedesechia aethiopia,* in the same locality. In neither case were the aphids abundant enough to cause noticeable damage.

Cryptomyzus ribis (Linnaeus).

Leaves attacked by this aphid will ordinarily become cupped and twisted, finally acquiring a pink or reddish color. In Utah red currant bushes are commonly attacked, and the damage is particularly obvious because of the color assumed by the more severely damaged apical leaves.

Noticeable damage has frequently been observed at Farmington, Logan, Providence, Salt Lake City, Smithfield, and a few other localities in Utah.

Phorodon humuli (Schrank).

This aphid, known commonly as the hop aphid, during the spring of 1926 was causing slight damage to plum trees at Hyde Park, Utah. These green aphids were thickly grouped on the underside of many of the leaves, while other leaves would be entirely free from attack. This species has also been collected in Utah from the leaves of hop plants at Logan, Logan Canyon, Madsen, Providence, and Salt Lake City.

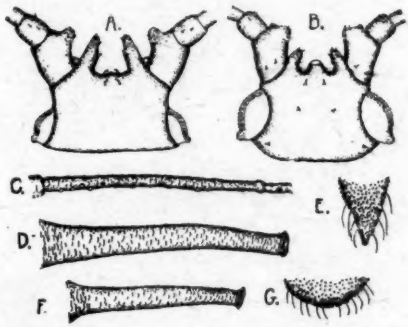

Fig. 5. *Phorodon humuli* (Schrank). *A.* Head of apterous viviparous; *B.* Head of alate viviparous; *C.* Antennal III of alate; *D.* Cornicle of apterous; *E.* Cauda of alate; *F.* Cornicle of alate; *G.* Anal plate of apterous.

Capitophorus oestlundi Knowlton.

This species was very abundant in northern Utah during 1926, but much less numerous during 1927. Since the original description of this species,[3] specimens have been taken from the following localities in Utah; Collinston, Cornish, Deweyville, Emery, Fort Duchesne, Fruitland, Hatton, Hooper, Huntington, Kanosh, LaPoint, Meadow, Milford, Penrose, Plain City, Plymouth, Portage, Randlett, Salina, Sevier, Sigurd, Vermillion, and Washakie. This species was also collected from the following localities in Idaho during 1927: Emigration Canyon, Malad, Paris, and Woodruff.

Capitophorus elongatus n. sp.

This shining green aphid is rather common in many parts of Utah, where it feeds on the leaves and tender parts of the bark of rabbit brush, *Chrysothamnus nauseosus* and *C. parryi,* and occasionally on *C. viscidiflorus.* This elongate aphid is often rather abundant on the apical portions of the twigs, but seems to produce no injury.

This aphid somewhat resembles a long, narrow form of *Macrosiphum packi* Knowlton, but differs noticeably in the following respects: Antennae less densely black and armed with minute, rather than prominent, hairs; hairs on front of head fanshape, rather than long and tapering; cornicles similar in shape, but shorter and less densely black over most of the surface. The ranges of these two species overlap, but apparently *Capitophorus elongatus* does not produce the very large females such as are so frequently encountered in *Macrosiphum packi.*

3.—Knowlton, George F. A few *Capitophorus* species of Utah with descriptions of two new species (Aphididae). *In* Canadian Entomologist, Vol. 59, (1927) p. 235.

Alate vivipara.—Color, apple green, sometimes lighter green; body 1.7 to 2 mm. long and narrow; rostrum short, scarcely reaching second coxae; antennae long, dusky beyond base of III, and armed with minute sensilla; antennal III, 0.8 to 0.83 mm. long and armed with 10 to 16 small sensoria; IV, 0.8 to 0.85 mm.; V, 0.7 mm.; VI, 0.15 + 1.05 to 0.17 + 1.18 mm.; wing veins dusky brown and conspicuous; the media of forewings twice branched; hind wing with both media and cubitus present; legs long and slim, hind tibia 1.5 mm. long; cornicles pale, slender, 0.45 to 0.5 mm. long, with a slight swelling before the weak flange; cauda pale, to slightly dusky, long, with two or three hairs on each side and two on the dorsal surface; anal plate broadly rounded to somewhat cone-shaped.

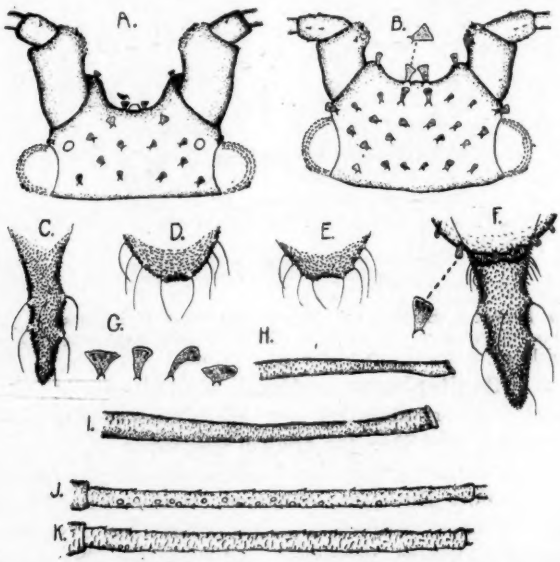

Fig. 6. *Capitophorus elongatus* n. sp. *A.* Head of alate viviparous; *B.* Head of apterous viviparous; *C.* Cauda of alate; *D.* Anal plate of alate; *E.* Anal plate of apterous; *F.* Cauda and eighth abdominal segment of apterous; *G.* Body hairs of apterous; *H.* Cornicle of alate; *I.* Cornicle of apterous; *J.* Antennal III of alate; *K.* Antennal III of apterous.

Winged females were collected on June 26 to 28, 1927 from the following localities in Utah: Alton, Circleville, Gooseberry, Junction, Kanab, Marysvale, Mt. Carmel, Niache, Panguitch, Richfield, and Spry.

Apterous vivipara.—Color shining apple green; body 2.6 to 2.85 mm. long and rather narrow; rostrum short, reaching second coxae; ocular tubercles rudimentary or lacking; antennae much longer than body, dusky to black beyond the middle of III, and armed with minute sensilla; antennal III, 0.68 to 0.85 mm. long and armed with 1 or 2 small sensoria on the basal fourth of the segment; IV, 0.83 to 1.0 mm.; V, 0.8 to .0.88 mm., with primary sensorium very near to distal end of segment; VI, 0.18 + 1.2 to 0.19 + 1.25 mm.; legs long and slender, hind tibia 1.55 mm. long; cornicles pale, occasionally dusky at distal end, slender, 0.56 to 0.7 mm. long, with surface uneven, and with a slight swelling before the

moderate flange; cauda pale to slightly dusky, elongate, usually reaching slightly beyond ends of cornicles, usually with two hairs on each side, one or two on dorsal suface, and sometimes appearing constricted near base, because of the enlargement around the bases of the hairs; anal plate slightly elongate, with a small depression in the center.

Localities from which wingless forms only have been collected in Utah include: Aurora, Chester, Elsinore, Fountain Green, Fruitland, Glendale, Milford, Orton, Santaquin, Sawtooth, Scipio, Sigurd, and Torry.

Cotypes are in the collections of the U. S. National Museum, Utah Agricultural Experiment Station, and writer.

Capitophorus gregarius n. sp.

This brown aphid is occasionally encountered in large colonies on the leaves of rabbit brush, *Chrysothamnus nauseosus*. The young tip leaves are most commonly infested, and if the infestation is heavy enough the aphids may produce colonies upon all or nearly all of the leaves of the plant. The leaves are usually attacked on both sides, and appear from a distance, as thick brownish-gray masses. The aphids crowd tgoether so that very seldom is any part of the leaf visible. Ordinarily they feed with the head toward the petiole. Usually the apical leaves are heavily infested while the lower leaves are entirely free from aphids.

The colonies of this aphid most resemble those of *Capitophorus oestlundi* Knowlton, but can readily be distinguished from the latter by the greater size and wider abdomen, as well as by the noticeable difference in color. This species scarcely would be confused with any of the numerous forms so far collected from rabbit brush in Utah.

Apterous vivipara (spring form).—Color dark brown to chocolate brown; size 2.3 to 3 mm. long; rostrum short, reaching second coxae; ocular tubercles vestigial or entirely lacking; body armed with numerous prominent fanlike to fingerlike sensilla; antennae nearly as long as body, and light brown, except distal ends of III, IV, most of V and all of VI, which are black; antennal III, 0.5 to 0.53 mm. long, with 1 to 5 round sensoria on slightly protruding bases; IV, 0.37 to 0.42 mm.; V, 0.36 to 0.4 mm.; VI, 0.1 + 0.35 to 0.11 + 0 44 mm.; legs of moderate length, hind tibiae 1.17 mm. long; abdomen rather broad, and armed with a row of conspicuous dorsal tubercles along each side of the median line, and somewhat larger toward the caudal end; much smaller, more lateral tubercles also occur on a few of the posterior segments; cornicles black, 0.41 to 0.49 mm. long, usually somewhat bent, very slightly swollen toward distal end (and sometimes near the base) with a constriction before the flange; cauda dusky, rather long, armed with 4 to 6 hairs on each side and one or more on the dorsal surface; anal plate dusky, broadly rounded to quadrangular.

Apterous vivipara (summer and fall forms).—Differs from the spring form in color being brown to greenish brown; size 2.8 to 3.2 mm. long; antennal III, 0.67 to 0.78 mm. long and armed with 1 to 6 sensoria; IV, 0.65 to 0.75 mm.; V, 0.67 to 0.74 mm.; VI, 0.16 + 0.8 to 0.17 + 1 mm.; hind tibia 1.7 mm. long; cornicle 0 65 to 0.7 mm. long; cauda long, and often with only 3 or 4 sensilla on each side, and one or more on dorsal surface at distal end.

Apterous ovipara.—Color greenish-brown to tan; size 2.3 to 2.8 mm. long; body hairs longer than in spring vivipara; rostrum reaching second coxae; eyes with ocular tubercles lacking; antennae longer than the body, dusky to black; antennal I, better developed than in spring aptera; III, 0.61 to 0.67 mm. long and armed with 2 to 5 small round sensoria; IV, 0.53 to 0.56 mm.; V, 0.51 to 0.56

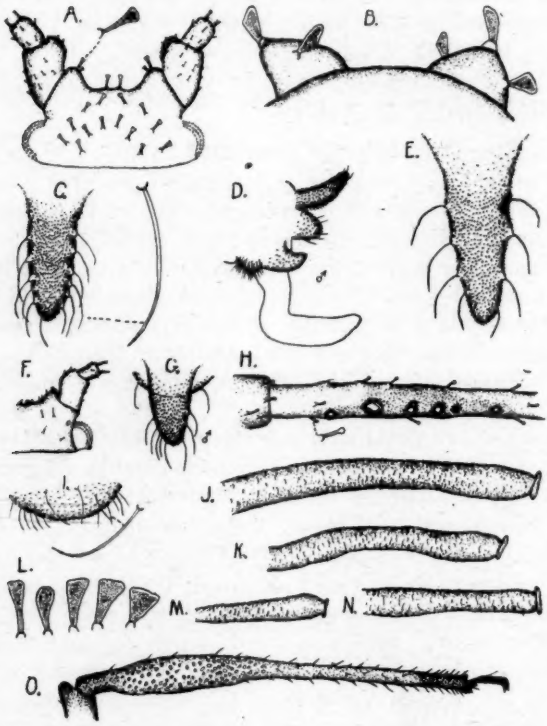

Fig. 7. *Capitophorus gregarius* n. sp. *A.* Head of summer apterous; *B.* Abdominal tubercles of spring apterous; *C.* Cauda of spring apterous; *D.* Genitalia of male; *E.* Cauda of summer apterous; *F.* Head of male; *G.* Cauda and anal plate of male; *H.* Part of antennal III of summer viviparous; *I.* Anal plate of summer viviparous; *J.* Cornicle of late summer apterous; *K.* Cornicle of spring apterous; *L.* Body hairs of summer apterous; *M.* Cornicle of male; *N.* Cornicle of apterous oviparous; *O.* Hind tibiae of apterous oviparous.

mm.; VI, 0.11 + 0.75 to 0.12 + 0.9 mm.; most of basal half of hind tibia swollen and armed with numerous small round sensoria; abdomen broad, with dark bands across the dorsum and often with dusky areas on the sides; dorsal tubercles black; cornicles black, 0.4 to 0.45 mm. long, basal part slightly swollen and distal portion often very slightly swollen for a short distance preceeding the flange; cauda black, slightly shorter and broader than in the summer aptera, with 4 or 5 hairs on each side and one on the dorsal surface at distal end; anal plate dusky and quadrangular to broadly oval.

Egg.—Egg is 0.75 mm. long and rather thick.

Alate male.—Color blackish-brown; size 1.5 to 1.75 mm. long; rostrum reaches second coxae; ocular tubercles much reduced; antennae black and considerably longer than the body; antennal III, 0.7 to 0.72 mm. long and armed with 28 to 45 small, round sensoria; IV, 0.68 to 0.71 mm., with 24 to 45 sensoria; V, 0.67 to 0.72 mm., with 25 to 40 sensoria; VI, 0.13 + 1 to 0.18 + 1.1 mm.; legs black, rather long, hind tibiae 1.6 mm. long; wing venation typical (occasionally second branch of media is lacking from one wing). Veins dusky; cornicles black, 0.23 to 0.26 mm. long, moderately swollen on distal half, and with a constriction before the flange; cauda elongate, with 4 to 5 hairs on each side; anal plate black and broadly rounded.

This aphid has been collected in Utah from the following places: Big Cottonwood Canyon, Bothwell, Brigham Canyon, Brigham City, Deweyville, Honeyville, Logan, Logan Canyon, Milford, Perry, Salt Lake City, Thatcher, Tremonton, Wanship, and Wellsville Canyon. It has been found also in Emigration Canyon, Idaho.

Cotypes are in the collections of the U. S. National Museum, Utah Agricultural Experiment Station and writer.

NEW NEARCTIC CRANE-FLIES (TIPULIDAE, DIPTERA). PART XIII.

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The preceding part under this general title was published in 1927 (Can. Ent., 59: 184-193). In the present instalment, I wish to describe a few novelites that have come to hand in recent years and to add records of certain rare species of Tipulidae. As is the case with numerous recent papers that I have published on the Nearctic crane-fly fauna, the present report is based chiefly on certain very interesting species that were collected in Michigan, Indiana, Tennessee and Florida by Professor J. Speed Rogers. One interesting species of *Erioptera* was included in material sent to me for determination by Professor Painter. The new species of *Dicranomyia* was collected in Nova Scotia by Mr. Gibson and in Massachusetts by Mr. Johnson. The very interesting new *Tipula* from Alaska was secured by Dr. Aldrich. I wish to thank all of these gentlemen for their kind and appreciated co-operation in making known the involved crane-fly fauna of North America.

RECORDS OF DISTRIBUTION:

Tipula margarita Alexander. 1 ♂, Columbus, Ohio, May 28, 1925 (*R. H. Painter*). Known hitherto only from New York.

Dicranoptycha septemtrionis Alexander. River Raisen, Jackson Co., Michigan, August 9, 1922 (*F. M. Gaige*), through Professor Rogers. Known only from New York and New England. The outer dististyle of the male hypopygium is somewhat longer and more slender than in the type though approached by paratypical material from Niagara Falls, New York.

Dicranoptycha pallida Alexander. Jefferson Co., Indiana, July 1917, August 1, 1919 (*J. S. Rogers*). Known hitherto only from Kansas.

Teucholabis myersi Alexander. Dade Co., Florida, December 18, 1927 (*J. S. Rogers*); Coll. No. 2. Known hitherto only from western Cuba.

Ormosia adirondacensis Alexander. Fentress Co., Tennessee, Clear Fork at Crooked Creek, altitude 1200 feet, June 20, 1924 (*J. S. Rogers*); Coll. No. 44. Allardt, Buffalo Cove, altitude 1500 feet, June 11, 1924 (*J. S. Rogers*); Coll. No. 14.

Ormosia frisoni Alexander. Ann Arbor, Michigan, May 14, 1917 (*J. S. Rogers*). Known hitherto only from Illinois.

Ormosia nigripila (Osten Sacken). Leon Co., Florida, April 23, 1924 (*J. S. Rogers*). In the male, the outer arm of the outer dististyle is somewhat longer and more slender than in specimens from New England.

Ormosia rubella (Osten Sacken). Bibb Co., Georgia, November 30, 1923 (*J. S. Rogers*).

DESCRIPTIONS OF NEW SPECIES.

Tipula aldrichiana n. sp.

Belongs to the *arctica* group; general coloration grey, the thoracic stripes ill-defined; antennae relatively short; wings greyish brown, variegated with whitish subhyaline; abdomen reddish orange, the tergites narrowly trivittate with dark brown; hypopygium dark; ninth tergite an elevated flattened thin plate, entirely chitinized, the margin four-toothed.

Male.—Length about 12 mm.; wing 11.8 mm.

Frontal prolongation of head relatively elongate, dark grey; nasus short and stout; palpi dark brown. Antennae relatively short, if bent backward not extending far beyond the wing-root; scapal segments brownish yellow; first flagellar segments relatively short and only moderately incised. Head grey, with a vague capillary median brown line; eyes relatively small, the distance between the eyes considerably greater than the diameter of one.

Mesonotal praescutum yellowish grey, the usual stripes concolorous, their presence indicated only by remnants of narrow brown margins, the most conspicuous being the mesal and cephalic borders of the lateral stripes forming a crook around the anterior end of the stripe; median stripe with a vague darker line on cephalic half of sclerite; remainder of mesonotum grey with a vague capillary brown line. Pleura grey, the dorso-pleural region brownish yellow. Halteres brownish yellow, the base of the stem clearer yellow, the knobs dark brown. Legs with the coxae grey; trochanters dark brown, sparsely pruinose; femora brownish yellow, clearer basally, the tips passing into dark brown; tibiae brownish yellow, the tips infuscated; basitarsi brown, the tips and remainder of tarsi dark brown. Wings with a greyish brown tinge, cell *Sc* yellow; stigma small, brown; small brown clouds at origin of *Rs* and on anterior cord; membrane variegated with whitish subhyaline areas, as in the group, distributed as follows: Beyond the cord, extending into the base of cell M_3; obliterative areas before the cord, including the veins; large pale areas, including about all of cell *R*, the basal third and at near two-thirds the length of cell *M*, near the bases of cells *Cu* and *1st A*, the latter area continuing to the margin along vein *2nd A*; veins dark brown. Venation: R_{1+2} entire; petiole of cell M_1 about one-third to one-fourth the cell and about one-half longer than *m*; M_{3+4} a little longer than the petiole of cell M_1.

Abdomen strongly reddish orange, the tergites trivittate with dark brown, the median stripe broader, very narrowly interrupted at the posterior margins

of the segments; sublateral stripes narrower; lateral margins of tergites buffy grey, the caudal margins more narrowly so; sternites reddish orange, the outer segments darkened; hypopygium dark, pruinose. Male hypopygium small, the ninth tergite an elevated flat thin plate, heavily blackened throughout; extreme caudal margin notched, these identations including a very low U-shaped median notch, the lateral angles produced into acute, slightly decurved teeth, these appearing as dorsal teeth when viewed laterally; at the ventral margin of the plate, a second subequal acute tooth, this likewise visible laterally. Outer dististyle a small flattened elongate-oval dusky lobe. Ninth sternite with a very deep V-shaped notch. Eighth sternite unarmed.

Habitat.—Alaska.

Holotype, ♂, Healy, June 26, 1921 (J. M. Aldrich). Type in the United States National Museum.

Named in honor of the collector, Dr. John M. Aldrich. Superficially the species bears a marked resemblance to *T. bergrothiana* Alexander but the structure of the ninth tergite is very different. In *bergrothiana,* this is a flat, concave saucer, whereas in the present species, it is an arched hood-like, very thin plate. *Tipula septentrionalis* Loew and *T. perretti* Alexander have a somewhat similar arched tergal plate but are very different in other characters.

Dicranomyia gibsoni n. sp.

Related to *D. haeretica;* general coloration dark brown, the thorax with a sparse golden-yellow pollen; male hypopygium with the rostral prolongation of the ventral dististyle long and slender.

Male.—Length 7-9 mm.; wing 7-8 mm.

Female.—Length about 7 mm.; wing about 8 mm.

Rostrum and palpi dark brown throughout. Antennae dark brown. Head dark, passing into yellow beneath.

Pronotum dark brown, with a sparse yellow pollen. Mesonotal praescutum brown, darker medially, the surface with a sparse golden-yellow pollen, the median region of the scutum to postnotum more pruinose. Pleura dark, yellowish grey pruinose. Halteres short, yellow, the knobs dark brown. Legs with the coxae and trochanters brownish yellow; remainder of legs brown, the femoral bases more yellowish. Wings with a faint brownish tinge, the stigma only faintly indicated; veins dark brown. Venation: Sc_1 ending opposite the origin of *Rs*, Sc_2 shorter, removed from this tip, Sc_1 alone being about two-thirds *m-cu;* cell 1*st* M_2 relatively small, subquadrate to rectangular; m-cu close to the fork of *M*.

Abdomen unusually long for a member of this group, tergites dark brown; basal sternites more obscure yellow, the outer sternites and hypopygium dark. Male hypopygium of the same general structure as *haeretica* but the rostral prolongation of the ventral dististyle prolonged into a slender, gently curved rod, the two spines placed at near one-third the length.

Habitat.—Coastal Northeastern North America.

Holotype, ♂, Smith's Cove, Nova Scotia, August 6, 1925 (A. Gibson).

Allotopotype, ♀.

Paratopotypes, 5 ♂ ♀, 2 fragments; paratypes, several ♂ ♀, Nantucket Is., Massachusetts, in salt marsh, August 21, 1926 (C. W. Johnson).

Type No. 2572 in the Canadian National Collection. Paratypes in Boston Society of Natural History and collection of the author.

Dicranomyia gibsoni is very distinct from the crane-fly that I have determined as *haeretica* Osten Sacken. There is a slight possibility of a mis-determination of the latter, since the type has not been critically examined. It is virtually certain that the Nantucket paratype of *D. moniliformis* Doane (but not the type from Colorado) pertains to the present species. I take pleasure in dedicating this species to the collector of the type, Mr. Arthur Gibson, Dominion Entomologist.

Dicranota notabilis n. sp.

Size very large (wing, ♀, over 9 mm.); general coloration pale yellow; wings pale yellow, the costal margin a little infumed; vein R_4 arising at or beyond the end of *Rs*, cell R_4 thus being sessile or subsessile; cell *1st* M_2 closed.

Female.—Length about 10 mm.; wing 9.5 mm.

Rostrum obscure yellow, the palpi a trifle darker. Antennae pale throughout, 15-segmented; basal flagellar segments crowded, short-cylindrical, the outer segments passing into oval, the outermost segments again short-oval and more crowded; the right antenna of the unique type is broken beyond the scape and this latter is discolored, apparently by burning at trap-lantern. Head brownish, obscure yellow behind; vertical tubercle low but conspicuous; eyes hairy.

Thorax pale reddish yellow, the pleura somewhat clearer yellow. Halteres yellow. Legs yellow, the tips of the femora and tibiae narrowly and weakly infumed; terminal tarsal segments slightly infuscated. Wings with a pale yellow tinge, the base and costal margin a little infumed; restricted slightly darker seams on the supernumerary crossvein and R_2; veins yellow, a little darker on the anterior half of the wing, the cord brown. Venation: Sc_2 some distance before the origin of *Rs*, first section of Sc_2 R_1 about two-thirds *Rs*; cell R_4 sessile to short-petiolate, with *r-m* at near midlength of this abbreviated R_{4+5} or in transverse alignment with R_{2+3}; R_{2+3} subperpendicular at origin, thence subangularly bent; cell *1st* M_2 closed; *m* connecting with M_2 just beyond origin and M_3 at near two-fifths its length beyond the fork of *M*.

Abdomen obscure yellow, the tergites a very little darker. Ovipositor with the tergal valves highly compressed, gently upcurved, the tips subacute.

Habitat.—Tennessee.

Holotype, ♀, Allardt, Fentress Co., altitude 1500 feet, June 21, 1924 (J. S. Rogers); Coll. No. 45.

Type returned to Professor Rogers.

Dicranota notabilis is the largest species of the genus known to me. In the Nearctic fauna, it is closely related only to *D. pallida* Alexander (New Hampshire), agreeing in the yellowish color and closed cell *1st* M_2, differing most evidently in the larger size and venation of the radial field. In *D. pallida*, vein R_4 has been captured by R_{2+3} to form a long R_{2+3+4}.

Polymera (Polymera) rogersiana n. sp.

General coloration black or brownish black, discolored in the types; antennae longer than the body in the male sex; femora brownish black; tibiae brown, the tips narrowly blackened; basitarsi infuscated, the remainder of the tarsi dirty white; wings with a strong brownish suffusion, with clearly defined dark brown spots; R_{2+3+4} longer than R_{2+3}.

Male.—Length 4.2-4.6 mm.; wing 5-5.3 mm.; antennae about 6.5 mm.

Rostrum and palpi black. Antennae (♂) much longer than the body, as shown by the measurements, black, the ends of the flagellar segments pale yellow to produce an annulated appearance. Head black, discolored.

Thorax black, discolored in all the available specimens. Halteres dusky. Legs with the femora brownish black; tibiae brown, the tips narrowly blackened; basitarsi infuscated; outer tarsal segments dirty white, clearer white on the posterior tarsi where it includes the distal end of the basitarsus, segments two and three and the base of four; outer tarsal segments infuscated. Wings with a strong brownish suttusion, the center of the disk clearer, subhyaline; clearly delimited dark brown spots arranged as follows: Origin of *Rs;* along cord; fork of R_{2+3+4}; R_2 and fork of M_{3+4}; veins and macrotrichiae dark brown. Venation: R_{2+3+4} long, subequal to or longer than *Rs* and longer than R_{2+3}; *m-cu* subtransverse.

Abdomen dark brown, the basal segments still darker; hypopygium dark brown.

Habitat.—Florida.

Holotype, ♂, Gainesville, Alachua Co., June 24, 1927 (J. S. Rogers).

Paratopotypes, ♂ ♂, with the type.

Type returned to Professor Rogers.

I take great pleasure in dedicating this very distinct species to Professor Rogers. *Polymera rogersiana* is allied to *P. obscura* Macquart, differing especially in the uniformly darkened femora, the distinct, clearly-defined wing-spots and the details of venation.

Erioptera painteri n. sp.

Female.—Length about 5.5 mm.; wing 5 mm.

Most closely allied to *E. cinctipennis* Alexander, differing especially in the wing-pattern and venation.

Rostrum, palpi and antennae black, the latter short. Head clear grey pruinose. Mesonotal praescutum dull brownish grey with three brown stripes, the median stripe broad, paler medially to form ill-defined lateral margins, the stripe better indicated behind; scutum brownish grey; scutellum and postnotum clear grey. Pleura grey pruinose. Halteres yellow, the base of the stem darker. Legs with the coxae grey; trochanters dark brown; remainder of legs brownish black throughout. Wings much broader than in *cinctipennis,* tinged with yellow, the base and costal margin clearer yellow; stigma elongate-oval, darker brown; sparse brown seams on certain of the veins, more conspicuously so on the basal half of *Rs,* along the cord, extreme apex of wing and as seams along *Cu, 2nd A* and on the axilla; veins brown, *Sc* and *R* more yellowish. Venation: R_{2+3+4} long, nearly twice *r-m;* R_2 subequal to R_{2+3}; R_3 and R_4 gently divergent; *m-cu* shortly beyond the fork of *M;* base of *1st A* very faint, atrophied in the type.

Abdomen brownish black, with conspicuous yellowish setae; genital segment paler brown. Ovipositor with the tergal valves elongate, acutely pointed at tips.

Habitat.—Ohio.

Holotype, ♀, Columbus, May 9, 1925 (R. H. Painter). Type in the collection of the writer. Named in honor of the collector.

Erioptera (Erioptera) viridula n. sp.

Belongs to the *chlorophylla* group; male hypopygium with both dististyles bent laterad near tips; inner distystyle with a small black spine at bend; lateral gonapophyses with the apices set with microscopic spiculae.

Male.—Length, 4.5-5 mm.; wing, 5.5-6 mm.

Female.—Length, 5-6 mm.; wing, 6-7 mm.

General coloration of the entire body pale chlorophyll green. Eyes of male contiguous beneath. Wings greenish subhyaline; veins green. Male hypopygium with the outer dististyle stout, the apex more expanded into a blade that is produced laterad, forming a boomerang-shaped structure, the apex blackened but smooth. Inner dististyle with the stem subequal to that of the outer style but more slender, the apex similarly bent strongly laterad although only a little wider than the stem; at bend on outer margin darkened and produced into a small blackened tuberculate spine that is surrounded by microscopic setulae. Lateral gonapophyses pale nearly, straight, narrowed to the subacute tips, the distal fourth darkened, the surface set with microscopic erect spiculae; inner gonapophyses long and slender, sinuous, decussate. Ovipositor with the valves long and slender, concolorous with the remainder of the body, the margins smooth.

Habitat.—Vermont.

Holotype, ♂, Woodcrest Farm, near foot of Mt. Mansfield, Green Mts., altitude 1000 feet, in a boggy meadow, June 27, 1927 (C. P. Alexander).

Allotopotype, ♀.

Paratopotypes, 15 ♂ ♀, June 22-27, 1927. Type in the collection of the writer.

Ormosia huronis n. sp.

Allied to *O. bilineata* Dietz; male hypopygium with the outer dististyle a simple black spine; inner dististyle with the base a flattened blade, near apex with a single powerful black spine.

Male.—Wing, 4.6 mm.

Legs light brown. Wings with a bright brownish suffusion, the base more yellowish; stigmal region a little darker but the color diffuse; veins pale brown. Venation: Sc_1 ending about opposite R_2, the latter nearly twice R_{3+4}; cell M_2 open by the atrophy of the outer deflection of M_3; vein *2nd A* nearly straight, feebly sinuous on distal third, cell *1st A* widened to the margin.

Abdomen dark brown, the hypopygium a little brighter. Male hypopygium (Fig. 1) with the ninth tergite (9t) conspicuous, narrowed at base, expanded outwardly, before the apex nearly three times as wide as at base, the apical margin gently convex with a vague shallow median incision. Outer dististyle (od) a straight black spine from an enlarged base. Inner dististyle (id) stouter, the base a flattened blade that is extended caudad into an acute point, the surface of the blade-like portion with setigerous punctures; apex of the style narrowed into a beak that bears close to its apex a single long powerful, gently curved spine that is virtually as long as the style itself. Gonapophyses (g) with a long, slender, feebly clavate inner arm and a shorter, gently curved, basal outer spine.

Habitat.—Michigan.

Holotype, ♂, Washtenaw Co., May 29, 1927 (J. S. Rogers); Collector's No. 823. Type returned to Professor Rogers.

The peculiar structure of the male hypopygium readily distinguishes the present species. It is somewhat similar to *O. bilineata* Dietz (Fig. 2), especially in the structure of the gonapophyses but differs in the simple outer dististyle and entirely differently formed inner dististyle.

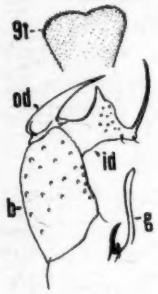

Fig. 1

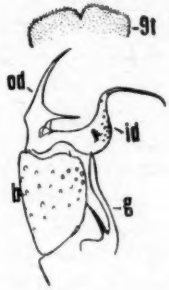

Fig. 2

Fig. 3

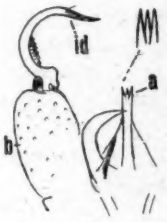

Fig. 4

Fig. 1. *Ormosia huronis* n. sp.; male hypopygium. 2, *O. bilineata* Dietz; male hypopygium. 3. *O. ingloria* n. sp; male hypopygium. 4. *O. nimbipennis* Alexander; male hypopygium. Symbols: *a*—aedeagus; *b*—basistyle; *g*—gonapophysis; *id*—inner dististyle; *od*—outer dististyle; t—tergite.

Ormosia ingloria n. sp.

Allied to *O. nimbipennis* Alexander; general coloration black, the praescutum and scutal lobes with more reddish brown markings; wings with a dusky tinge, sparsely variegated with whitish areas; male hypopygium with the outer dististyle not terminating in a spine; aedeagus simple at apex.

Male.—Length, about 4 mm.; wing, 4.8-5 mm.

Female.—Length, about 4.8 mm.; wings, 5.2 mm.

Rostrum and palpi dark. Antennae dark brown, the basal flagellar segments bicolorous, both ends of the individual segments being pale; outer segments more slender and more uniformly darkened; antennae (♂) of moderate length, if bent backward extending about to the wing-root. Head dark brown.

Pronotum dark brown. Mesonotum dark brownish grey, the praescutum with three slightly more reddish brown stripes, the interspaces defined by black setiferous punctures; posterior sclerites of notum and the pleura blackened. Halteres obscure yellow. Legs with the coxae dark; trochanters brownish testaceous; femora brown, darker before the tips, the color obscured by dark setae; tibiae and tarsi passing into brown, with yellowish setae. Wings with a dusky tinge, the costal region more intensely so; stigma darker brown; conspicuous whitish areas distributed as follows: In prearcular region; before and beyond the stigma and before the cord, chiefly in the outer end of cell R; veins and macrotrichiae dark, the former paler in the whitish areas. Venation: R_1 close to the fork of R_{2+3+4}; cell M_2 open by the atrophy of the outer deflection of M_3; *m-cu*

more or less arcuated or angulated, placed close to or before the fork of *M;* vein *2nd A* strong sinuous, the distal half strongly bent, cell *1st A* being markedly widened at near midlength.

Abdomen brownish black, with yellow setae; hypopygium dark. Male hypopygium (Fig. 3) with the inner dististyle (i.d.) a strongly curved, boomerang-shaped rod that is pale in color throughout, not narrowed into an apical spine, the obtuse apex with a long curved seta. Outer dististyle very reduced or lacking. Gonapophyses appearing as gently curved black horns, the tips acute, at base with a slender spine that is nearly one-third the length of the entire apophysis. Aedeagus (a) with the apex simple.

Habitat.—Indiana.

Holotype, ♂, Hanover, Jefferson Co., August 26, 1927 (J. S. Rogers); Collector's No. 100.

Allotopotype, ♀; Collector's No. 102.

Paratopotypes, 2♀♀, with the allotype. Type returned to Professor Rogers.

Ormosia ingloria is allied to *O. nimbipennis* Alexander, in the great reduction of the outer dististyle of the male hypopygium and the elongation of the inner style. In *nimbipennis* (Fig. 4) the male hypopygium has the inner dististyle (id) strongly curved, terminating in an acute blackened spine; gonapophyses powerful, curved, the tips and the basal spine heavily blackened, and the aedeagus trifid at apex.

A NEW CAMPOPLEGIDEA PARASITIC ON ELLOPIA FISCELLARIA GN. (HYMEN., ICHNEUMONIDAE).*

BY G. STUART WALLEY,
Ottawa, Ont.

The following description is presented for a new species of *Campoplegidea* of the sub-genus *Viereckiana,* bred from larvae of the hemlock looper (*Ellopia fiscellaria* Gn.) by Mr. Karl Schedl, during the summer of 1928.

Campoplegidea (Viereckiana) ellopiae n. sp.

Very similar to *C. fuscitarse* Vier. with which it agrees in size and general color. Resembles *C. totalis* Vier. but much smaller and the legs differently marked.

Female.—Length 10 mm.; propodeum with a shallow furrow, basal transverse carina not extending as far laterally as in *fuscitarse,* apical transverse carina obselete.

Head including antennae black; mandibles yellow, fuscous at base and apex; palpi yellowish stramineous; all coxae, hind trochanters and hind femora black; front trochanters yellowish above brownish beneath; mid trochanters brownish above, black beneath; front femora blackish, apex and flexor surface yellowish; mid femora blackish, apex yellow and flexor surface obscurely brown; mid tibiae and basal two-thirds of first tarsal joint yellowish, remainder of mid tarsi brownish; hind tibiae and tarsi black, the former with a yellowish stripe on upper surface. Abdomen reddish, all tergites with an obscure blackish tinge above, the

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

first tergite with a more pronounced elongate median triangular vitta and with lateral margins with a black line; sheaths black.

Holotype.— ♀, Footes Bay, Ont., Sept. 1, 1928, (K. Schedl), No. 2906 in the Canadian National Collection, Ottawa.

Allotype.— ♂, Footes Bay, Ont., Sept. 2, 1928, (K. Schedl).

Paratypes.—2 ♂ ♂, 3 ♀ ♀, Footes Bay, Ont., Aug. 22-30, 1928, (K. Schedl); ♂, Footes Bay, Ont., Sept. 8, 1928, (K. Schedl).

Notes.—The above species traces to *C. totalis* Vier. in Viereck's key to the species of *Viereckiana* Strand (Trans. Roy. Soc. Can., 1925, Section V, p. 173) but differs in being smaller (*totalis* is 15 mm. long) with the front coxae black not yellow in part and the mid tarsi usually not with the three basal joints pale as in *totalis*.

From *fuscitarse* Vier. the species differs in having the abdominal petiole reddish at the base, the basal joint of the mid tarsi yellowish on its basal two thirds, the basal propodeal carina shorter and the areolet subpetiolate or with the petiole much shorter than its shortest side. In *fuscitarse* the petiole is as long as the shortest side of the areolet.

Five paratypes of *ellopiae* were collected in Fehling's solution. The colors appear to be well preserved but the paler colors are more pronounced than in the dried material. One specimen has the three basal joints of the mid tarsi yellowish.

BOOK NOTICES.

Destructive and Useful Insects, Their Habits and Control. C. L. Metcalf and W. P. Flint. viii—918 pp., 561 text illustrations. New York, McGraw-Hill Book Co., 1928. Price $7.50.

This volume incorporates the work of twenty-five years in combating destructive insects on the part of one of the authors and fifteen years of teaching experience by the other author. It serves the dual purpose of a text-book for introductory courses in entomology and a guide-book for practical farmers, gardeners, etc., who desire up-to-date information concerning insect pests.

The first two chapters discuss the relation of insects to man; chapters iii—viii treat briefly, but succinctly, of the anatomy, morphology and metamorphosis of insects and their general classification; chapters ix-x are on insect control, and the remaining chapters, xi-xxiii, deal with the insects injurious to various field crops, fruits, shade and forest trees, stored products, domestic animals and man. These latter chapters, which occupy two-thirds of the book, contain numerous field keys and illustrations and should render the identification of the majority of the commoner injurious insects very easy.

Needless to say the high reputation of the authors is sufficient guarantee for the accuracy of the information contained in this contribution to Applied Entomology.

Elementary Lessons on Insects. James G. Needham. viii-210 pp. and 72 text figures. C. C. Thomas, Springfield, Ill., 1928.

The underlying idea of this work is to outline a brief, practical introductory course in entomology based on first-hand contact with the material, in order to develop a sound knowledge of the essentials of insect structure and development. Part I deals with the general anatomy, morphology and metamorphosis of insects; Part II treats very briefly of the various orders and contains numerous programs for both field and laboratory work; Part III discusses injurious insects and their control and Part IV gives instructions for the collecting, preserving and rearing of insects.

Although of necessity very limited in its scope the work should prove most useful for elementary classes.

Mailed Monday, February 4, 1929.